pylori to single antibiotic therapy. The most widely used treatment regimen for children consists of triple therapy with amoxicillin, metronidazole, and bismuth for 2 weeks and an antisecretory agent, usually an H-2 blocker, for 8 weeks. Although effective in eradicating *H pylori* in approximately 75% of cases, this regimen may be complicated by intolerance and poor compliance. Studies have demonstrated eradication of *H pylori* after a 1-week course of clarithromycin, omeprazole, and amoxicillin. Pediatric trials testing a number of alternative regimens using one or two antibiotics are currently under way. Urea breath tests, which should be available soon, will be useful in documenting eradication of *H pylori* following antibiotic therapy.

In the absence of peptic ulcer disease, treatment of children with gastritis and/or recurrent abdominal pain of childhood associated with *H pylori* is controversial. Children with chronic epigastric or retrosternal pain, with or without associated nausea, emesis, or family history of peptic ulcer disease, should be considered possible candidates for *H pylori* infestation.

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Update on Childhood Asthma

THE LAST DECADE has witnessed a dramatic change in the understanding and management of childhood asthma. Asthma is now viewed primarily as an inflammatory process, not a bronchospastic disorder. At the same time, the incidence, morbidity, and mortality of asthma are increasing. Childhood asthma incidence in many urban areas of the United States is now reported to be approaching 20%.

Inhaled corticosteroids are the most effective means of treating airway inflammation. Four inhaled corticosteroids are currently available: beclomethasone, flunisolide, fluticasone, and triamcinolone. All are administered twice daily; the dosage of each drug varies. The Food and Drug Administration (FDA) has approved inhaled corticosteroids as first-line therapy to prevent symptoms in chronic asthma, from mild to severe. Delivery by inhalation reduces systemic availability and the potential for adverse effects, but clinicians should be aware that high-dose (doses greater than 1000 to 1200 μg inhaled corticosteroid per day), long-term use poses a risk of delayed bone growth and adrenal insufficiency in children. To watch for bone effects, the child's growth should be monitored closely. Signs and symptoms of adrenal insufficiency may be seen when a child is exposed to trauma, surgery, or infection. Children may also experience hypothalamic-adrenal-axis (HPA) suppression as the dose of the drug is tapered. Recovery from HPA suppression may take several months.

Antileukotriene drugs represent a new class of asthma therapy. Leukotrienes, which are formed by the breakdown of arachidonic acid in the airways, contribute to asthma by causing airway edema, airway smooth-muscle constriction, and altered airway cellular activity associated with the inflammatory process. Antileukotrienes fall into two categories: receptor antagonists and 5-lipoxygenase inhibitors that reduce leukotriene synthesis. Clinical trials have found that both forms improve pulmonary function and reduce asthma symptoms in clinical asthma and cold-, exercise-, and aspirin-induced asthma. Zafirlukast, a leukotriene receptor antagonist, is the first FDA-approved medication of this type. The recommended dose of zafirlukast is 20 mg orally twice a day, administered at least 1 hour before or 2 hours after meals. It is not approved for use in children under the age of 12 years.

Peak flow measurements remain an important tool for children with severe or "brittle" asthma and for patients unable to gauge asthma severity. Clinicians should be aware of the limitations of peak flow measurements, however. Measuring peak flow may not improve treatment outcomes in patients with moderate asthma, and peak-flow-driven self-management plans apparently are no more effective than symptom-driven plans. The problems stem from poor compliance; falsification of recordings (one quarter of recordings are made up); and the unreliable performance of many home-use peak-flow meters, particularly in overreading midrange levels. In addition, the published levels at which treatment should be increased may be too low for some patients. In planning treatment, the clinician should adjust for inaccuracies in peak-flow meters and set treatment action-points on an individual basis.

Education and patient advocacy are essential to management of asthma patients, especially those with severe asthma. One way to provide both elements is through a case manager model, in which the physician or a designated case manager under the physician's supervision serves as both educator and facilitator. As an educator, the case manager helps patients and their families understand asthma physiology, asthma triggers, and the appropriate use of medications and devices (such as inhalers and peak-flow meters). Other case manager functions include assisting in the development and understanding of treatment plans and providing information about environmental measures to reduce allergens in the home. As a facilitator, the case manager helps find access to medical care and support groups; provides referrals for other needed treatments, such as psychological counseling or smoking cessation programs; and assists with housing, insurance, and other issues that affect asthma care.

Finally, one of the more exciting developments in childhood asthma care is the discovery that early intervention may reduce both the risk for developing childhood asthma and its severity. To prevent sensitization in children at high risk for allergies (i.e., with family history

of allergy/atopy), the child's diet should exclude cow's milk for the first year of life, eggs for two years, and peanuts for three years. Risk and severity may also be reduced by environmental controls to avoid exposure to dust mites and tobacco smoke.

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Immunization Update

THE 1997 RECOMMENDED IMMUNIZATION Schedule for Children reflects several important changes, including the recommended use of acellular pertussis vaccines combined with tetanus and diphtheria toxoids (DTaP) for use in infants; increased use of inactivated poliovirus vaccine (IPV) for healthy children; and guidelines for delivery of immunizations to adolescents. In addition, approval is expected for several new vaccines.

Pertussis

Three DTaP products have been approved for the primary series in infancy: ACEL-IMUNE, Infanrix, and Tripedia. In European clinical trials, these products were 80–89% efficacious for preventing pertussis, comparable to or better than the efficacy of whole-cell pertussis vaccines used in the United States. DTaP also causes fewer reactions (fever, irritability, swelling) than whole-cell preparations and is therefore preferred. Whole-cell vaccine is an acceptable alternative, however. It has the advantage of being combined with *Haemophilus influenzae* type b (Hib) vaccines for use in infancy, thus decreasing the number of injections administered. Tripedia combined with Hib (TriHIBit) is approved for children 15 months of age and older. The manufacturer anticipates FDA approval for use in infants in the summer of 1997.

Hepatitis B

All infants should be immunized against hepatitis B (Hep B), and all adolescents not previously immunized should be vaccinated. There are two hepatitis B products, Energix B and Recombivax, which can be used interchangeably if necessary. Energix B has received approval for the same dose (10 μg) to be used for all children from birth through 19 years of age. Recombivax is approved as a 2.5-μg dose through 10 years of age for children born to HBsAg-negative women, and as a 5-μg dose from 11 to 19 years of age for children born to HBsAg-negative women and for children of all ages born to HBsAg-positive women. COMVAX, a new combination product containing Hib (PRP-OMP) and Recombivax (5 μg), has recently become available. COMVAX can be used for routine immunization of all children 6 weeks of age and older.

Hepatitis A

Two hepatitis A vaccines (Havrix and VAQTA) have been licensed for children 2 years of age and older. The vaccines are indicated for children with chronic liver disease and those traveling to areas with high rates of hepatitis A or living in high-risk communities.

Polio

Thanks to the intense efforts coordinated by the Pan American Health Organization, the Western Hemisphere has been free of paralytic polio caused by wild-type poliovirus since 1991. The target for global eradication is the year 2000. Because of the decreased risk of exposure to wild-type polioviruses and the 8 to 10 cases per year of vaccine-associated paralytic polio, the US routine immunization schedule now emphasizes the increased use of IPV. Advisory groups consider the use of IPV alone, OPV alone, or a sequential schedule of two doses of IPV followed by two doses of OPV to be acceptable immunization schedules. The Advisory Committee on Immunization Practices (ACIP) gives preference to the sequential schedule, as this will prevent 50–75% of the 8 to 10 cases of vaccine-associated paralytic polio while maintaining optimal intestinal immunity in the general population.

Varicella

The recently released ACIP recommendations on varicella vaccine are consistent with the 1995 American Academy of Pediatrics guidelines. Both call for universal immunization of healthy children 1 year of age or older who have not had chicken pox. The varicella vaccine (Varivax) is also strongly recommended for all susceptible people in contact with immunocompromised children. The risk of the vaccine virus being transmitted from a vaccinated child to a close contact is minimal and is far outweighed by the benefits of immunization. One dose of Varivax is recommended for children under 13 years of age, two doses at 13 years and older.

Combination Products

The number of injections required to immunize children fully has increased, but combination products will help correct this problem. Two new combination products have been approved recently. COMVAX is available for use in infants and children, and TriHIBit is approved for use at 15 months or older. Currently TriHIBit must be mixed by the health care professional before administration, but should be available as a single product by mid-1997. Other combination products including DTaP/Hep B, DTaP/IPV/Hib, and DTaP/IPV/Hep B are being developed, and several manufacturers hope to produce a DTaP/Hep B/Hib/IPV combination for use at 2, 4, and 6 months of age. Thus, practitioners will shortly have several combination products from which to choose.